SETTING THE HEAVY GRANITE COLUMNS ON THE HALL OF RECORDS.

The handsome Hall of Records which is now building at the corner of Chambers and Center Streets is beginning to take on material form and to show forth the beauty of its design. Eight of the huge columns which are to adorn its exterior have been delivered and set up in position on the front of the building. The columns are the largest monoliths so far used in this city, having a shaft 4 feet 2 inches in diameter, and 36 feet long. The capitals are 6 feet in height and the base-stones 2 feet thick. The wei ht of each shaft is estimated at between 38 and 40 tons. The base-stones weigh 6 tons, and the capitals, carved from 19-ton blocks of granite, are estimated as weighing 15 tons. The columns were quarried from a white granite called Hallowell granite from Hallowell, Me. This stone, due to the homogeneity of its grain can be easily carved. It does not, however, take a good polish, and is ordinarily, as in this case, finished in the rough. One of the greatest difficulties in quarrying large blocks of stone is to find a suitable platform of stone free from cracks or flaws. Granite is a stratified rock, and whenever a large flawless layer of sufficient thickness is discovered, it is carefully reserved for use in filling large orders. When such an order comes the edge of the granite layer is faced and the required block is broken away by a moderate charge of powder placed in holes at frequent intervals along the desired line of fracture. The stones are then cut by hand to the proper shape, patterns being continually used to insure a perfect form. It took six to eight weeks to shape and flute each of the shafts shown in our illustration. When completed they were carefully boxed and sent by rail to Mott Haven, whence they were lightered to Pier A, at the Battery. From this point the truck shown in our illustration was used for carting each column to the building. The hauling was done at night when lower Broadway was practically deserted. In order to prevent the trucks from sinking into the asphalt street at the pier, planks were placed under the wheels and then the huge stone was lifted by a powerful derrick and lowered gently onto the truck. Twenty-two horses were used in carting the shafts to their destination, and in passing up Broadway depressions were constantly made in the street and man-holes were cracked and broken.

The problem of setting the columns was no small one. The derricks available had each a lifting power of 25 tons, and it was necessary to use two at a time to raise each column. It was important that each derrick should bear an equal part of the burden, for should a greater weight than 25 tons be accidentally shifted onto one of the derricks, a catastrophe would result. In order to preserve an exact balance of weight, a single stretch of cable was used for both derricks, the cable passing around an equalizer block which may be seen in the engraving between the two four-sheave blocks. Special care had to be exercised to protect the fluting from injury while the shaft was raised. Half round birchwood sticks, spaced and sized to fit snugly into the channels, were nailed to oak blocks, and the chains were then wrapped over these blocks around the shaft. Lewises were anchored in dovetail openings in the top face of the shaft and to these a block was lashed which abutted the ends of two of the side blocks. The purpose of this was to prevent the birch sticks from sliding along the fluting and breaking the stone at the end of the channels. Another difficulty which presented itself was the danger of damaging the butt of the shaft if it were permitted to bear the weight of the stone while being raised to vertical position. This difficulty was overcome by building a cradle, as illustrated, and resting the column on a round stud extending between the side walls. Two 3-inch steel pins inserted in the base of the shaft straddled this stud to keep the stone from slipping. The cradle was mounted on rollers and was so connected to the top of the column that any upward movement of the latter would result in a forward movement of the cradle. This advance motion was assisted by the use of hand-spikes as the shaft approached the vertical. The purpose of this device was to prevent sidewise swing of the derrick boom and to assist in the rapid setting of the columns. Twenty-four more columns are to be placed on this building, making thirty-two in all. The dimensions of these columns are the same as those just described, except that instead of having a round cross section, they are cut away along the rear surface where they will come in contact with the building.

THE END OF SEVERO'S AIRSHIP.

LIFTING A 40-TON COLUMN TO POSITION ON THE NEW HALL OF RECORDS, NEW YORK.

THE SEVERO AIRSHIP CATASTROPHE.

BY OUR PARIS CORRESPONDENT.

One of the most terrible accidents in the history of aeronautics is that which recently occurred at Paris, resulting in the death of the Brazilian inventor Severo and his aid, M. Saché. It was on the 12th of May that the dirigible balloon "Pax" made a free ascension for the first time from the Lachambre Aerostatic Park in the western part of Paris. The airship mounted at 5:40 A. M. A few minutes after the departure, when the balloon had risen to a height of 1,000 feet over the city and half a mile from the shed, a formidable explosion occurred, followed by a rapid fall of the airship, which was smashed to pieces on the Avenue du Maine. The two aeronauts were instantly killed.

The balloon "Pax," which has been recently described, was constructed at the Lachambre establishment, where the different balloons of Santos-Dumont were built. It was kept in an immense shed 100 feet high which had been built especially for it. It will be remembered that the form of the balloon is cigar-shaped, somewhat resembling that of Santos-Dumont's, except that the car, instead of being suspended below the body by cords, is partly surrounded by the balloon, the upper part being contained in a longitudinal groove which ran the whole length of the balloon body. It is also much larger and contained 80,000 cubic feet of gas. It was inflated with pure hydrogen, generated on the spot. The balloon had been filled for several days previously and had made a few trials in the adjacent grounds, and M. Severo was only waiting until the prevailing bad weather had ceased in order to make an ascension. On the preceding evening the weather cleared, and at midnight the preparations were commenced for a trial the next day. The workmen gave a final filling to the balloon and the operation finished at dawn, when the airship was taken outside.

Except for a light mist, the sky was clear, and a feeble west wind was blowing. Some preliminary trials were made near the ground, and the balloon seemed to make its evolutions with perfect ease, as it turned twice to the right and twice to the left and appeared to be easily handled. This encouraged M. Severo to make an ascent at once. It was his intention to steer against the wind and gain the maneuvering grounds at Issy, outside the city toward the west. As soon as it was let go the balloon mounted rapidly to a height of 1,000 feet, and then was observed to follow the direction of the wind and proceed toward the center of the city. Some affirm that the propelling screw worked well, and others that its action was ineffective. The airship was seen to describe several great circles in the air, under the action of the lateral screws, but afterward went in a straight direction. The aeronauts had thrown out too much ballast, which caused the balloon to mount to a great height. This is no doubt the main cause of the catastrophe. About fifteen minutes after the start a flame was seen to shoot out from the balloon, followed by a white smoke; then came a loud detonation, and the airship was enveloped in flames and burned rapidly. The framework shot down with one end foremost. The great mass fell across the Avenue du Maine, the rear screw breaking in the roof of a small house. The rear part, occupied by M. Severo, fell first. The spectators affirmed that the aeronaut was still alive when he reached the ground; his body was terribly mangled and he expired almost instantly. His aid, M. Saché, who was at the other end of the car, met his death in the air, and his body was half burned. After the bodies had been removed the government aeronauts, Col. Krebs and Commandant Renard, with a squad of 17 men, were occupied in clearing away the debris. The engraving gives an idea of the appearance of the wreck as it lay across the avenue, presenting an inextricable mass of broken poles, steel shafting and wires bent and entangled, and the half-burned remains of the envelope.

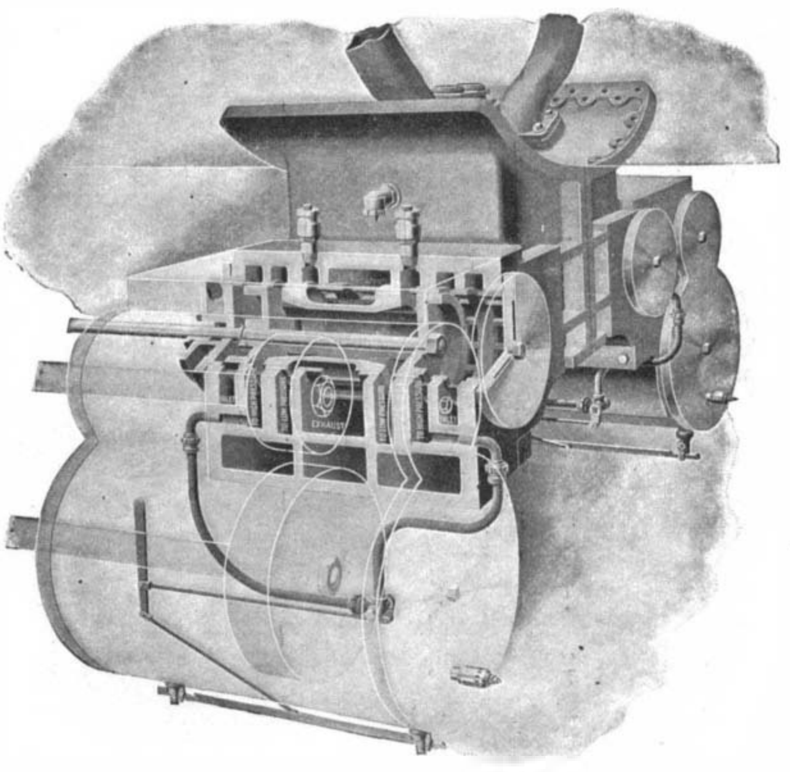
There is a diversity of opinion as to the exact cause of the catastrophe, but all are in accord that the main reasons lie in the balloon's rising too high, with a consequent dilatation of the envelope and escape of gas, and in the proximity of the great inflammable mass of the balloon to the motors and rapidly revolving shafting. It is not certain whence came the flame that ignited the hydrogen. The motor, which is badly burned, may have inflamed the gas or may itself have been burned by the flaming mass. The igniter is almost melted and the carbureter is considerably wrecked, also the gasoline reservoir, which contained seven gallons. There may have been an explosion of gasoline, but this could have been produced either before that of the hydrogen or after the latter had been inflamed. The exhaust pipe of the motor, which must have been brought to a red heat, could have been heated by the gasoline or by the burning hydrogen. Some think that the hydrogen was ignited by the friction of the shafts or gears, which were numerous and ran very near the envelope in some places. The different inflammable materials burned so quickly that it is not easy to say which took fire first. The reason of the escape of the hydrogen is clear. Most of the aeronauts are in accord that M. Severo mounted too quickly. The balloon, which had just been filled with hydrogen in a cool place, soon became very much dilated on reaching such a height. The rays of the morning sun and the difference of atmospheric pressure caused by the elevation to 1,000 feet soon brought about a strong expansion of the hydrogen. The gas may have passed through the silk envelope by rapid endosmose, or its force might have been strong enough to burst the latter; or it may have forced one of the valves which hung at the end of a canvas tube just above the motor. There is no doubt that at the time of the explosion the car was in an atmosphere of inflammable gas, which was all the more dangerous in that it gave no odor to reveal its presence. The large central groove running along the balloon, and containing the upper end of the frame, formed a kind of pocket in which an explosive mixture of gas and air could collect. This would explain the almost complete and immediate destruction of the envelope of 80,000 cubic feet, which came down in a rain of carbonized débris all over the neighborhood.

Santos-Dumont, who is now in Paris, thinks that two explosions of the envelope were produced; the gas burst the envelope by its excess of pressure, and this was immediately followed by the explosion of the hydrogen, which came in contact with the motor. The aeronaut, lacking experience, threw out too much ballast, and the airship mounted very quickly and much higher than was necessary. The fluid dilated, and not finding a sufficient issue, burst the envelope. It will be remembered that the fall was preceded by a detonation, and to form a detonating mixture twelve parts of air are needed for one of gas. The balloon could not, therefore, have contained the explosive mixture at first, or it would not have risen. Santos-Dumont considers, therefore, that the motor was not the primary cause of the explosion. M. Girardot in a conversation with the inventor made several observations on the arrangement of the motor, and both he and Charron insisted that it be provided with escape boxes so that the exhaust gases would not pass out in free air.

M. Severo was born at Rio Grande do Norte in 1864, and his family is one of the wealthiest and most influential in Brazil. After passing his University studies, he devoted himself almost entirely to aerial navigation, as his ample fortune permitted. Besides, he occupied an important position in Brazil, having been elected deputy in 1893 and continuing in the Parliament up to the present. He commenced his experiments about ten years ago, and had some success with his first airship, the "Bartholomeu de Gusmao." The government desired him to build a second airship, and after the success of Santos-Dumont he again took up the matter. The mechanic Saché was one of the most intelligent and skilled employés of the Buchet motor firm, who detailed him to work with M. Severo. The present accident resembles that which took place a few years ago in Germany, resulting in the death of Dr. Woelfert and his aid Knabe. The airship was cigar-shaped and had an explosion motor.

BUILDING OF AMERICAN LOCOMOTIVES.—I.

It would be difficult to find a form of mechanical construction in America which bears more strongly the imprint of our national characteristics than the American locomotive. In its general appearance, constructive details, and unquestionable convenience of operation, it stands entirely distinct as a type among the hundred-and-one styles of locomotives that are manufactured in the shops of the world. This national individuality is seen even more strongly in the great industrial establishments in which our locomotives are made, where labor-saving machinery and carefully-thought-out methods of shop management have enabled us to build at a speed and price which cannot be approached by any other nation. The magnitude of the locomotive industry in this country was emphasized in the festivities which attended the recent completion of their 20,000th locomotive by one of the locomotive works of this country, an event which occurred in the spring of the present year. The early founding of the Baldwin Locomotive Works, its rapid growth, the many standard types of locomotives which have been originated in the shops of the company, and the fact that its locomotives have been for years finding their way to the four corners of the earth render the works thoroughly representative of the locomotive industry in this country.



VIEW SHOWING SECTION THROUGH STEAM CHEST AND GENERAL ARRANGEMENT OF THE FOUR CYLINDERS.

Mathias W. Baldwin, who founded the establishment, started in business as a jeweler in a small shop in Philadelphia in the year 1819. In 1830 the steam railroad was beginning to make its appearance and establishing itself in this country, and to gratify public interest the proprietor of a Philadelphia museum gave an order to Baldwin for the construction of a miniature locomotive for exhibition. In the spring of 1831 the work was completed and the toy was set in motion on a circular railroad track at the museum. The success of the model brought an order to Baldwin for a locomotive from the Philadelphia, Germantown & Norristown Railroad Company. Guided by his experience with the little model, and by some memoranda which he had taken of a locomotive recently imported from England by the Camden & Amboy Railroad Company, Baldwin completed the curious and historical locomotive known as "Old Ironsides," of which we give an illustration on our front page. The engine was tried November 23, 1832, and did duty on the Germantown road and, later, on other roads for a period of over twenty years. The "Ironsides" was a four-wheeled engine, modeled after the English pattern of those days, and it weighed in running order something over five tons. The cylinders were placed beneath the smokebox and connected to a pair of cranks on the rear axle, which was placed in front of the firebox. The driving wheels were 54 inches in diameter, and the front wheels 45 inches in diameter. The cylinders were 9½ inches in diameter by 18 inches stroke, and they were carried beneath the smokebox, as is done to-day with modern inside-connected engines. The wheels had cast-iron hubs, wooden spokes and rims, and wrought-iron tires. The frame was of wood. The boiler was 30 inches in diameter and contained seventy-two copper flues 1½ inches in diameter. The valve motion was given by a single loose eccentric to each cylinder, and the engine was reversed by changing the position of the eccentric on the axle by a lever operated from the firebox. The contract price was $3,000.

The second engine, built in 1834 for the Charleston & Hamburg Railroad Company, was a six-wheeled engine with a single pair of drivers, 4½ feet in diameter, carried behind the firebox, with a half-crank axle of Baldwin's design. The wood and iron wheels used on the "Ironsides" having proved faulty, the driving wheels in this case were cast in solid bell metal. The "Miller" had cylinders 10 inches in diameter by 16 inches stroke, and weighed in working order about 8 tons. The boiler was constructed with a high circular dome over the firebox, a form of construction which was consistently followed for many years afterward. The next engine, the "Lancaster," built in 1834, weighed about 8½ tons, and in that year five locomotives were completed. In the following year, the business having outgrown the works, a location was found on Broad and Hamilton Streets, the site of the present works, then in the suburbs of the city. From that time on the growth of the plant was rapid, fourteen engines being built in 1835 and forty in 1836. Without attempting to go into the details of the progress of the works, it is sufficient to state that several standard American types had their origin in the Baldwin shops, and of these, perhaps the most notable are the "Consolidation," the "Mogul" and the "Atlantic" types. The "Consolidation," from which the type of this name was named, was built in July, 1866, for the Lehigh Valley Railway. She was a remarkably powerful engine for that day, with cylinders 20 by 24; four pairs of drivers connected, and a Bissell pony truck equalized with the front drivers. The engine in working order weighed 90,000 pounds. The "Mogul" class took its rise from an engine built for the Louisville & Nashville Railroad in 1861. The "Mogul" had three pairs of drivers connected, and a swinging pony truck, which was later equalized with the forward drivers. The first "Atlantic" type of locomotive was built in 1895 for the Atlantic Coast Line, which was followed by engines of the same type for the Atlantic City trains of the Philadelphia & Reading Railroad. The 1,000th locomotive was built in 1861. The 5,000th locomotive, built in 1880, was designed for fast passenger service between Philadelphia and New York, and to run with a light train at a speed of 60 miles per hour; its cylinders were 18 by 24, and it was carried on a four-wheel truck, one pair of 6½-foot driving wheels, and a pair of 45-inch trailing wheels equalized with the drivers. The 10,000th locomotive was completed in 1889; the 15,000th in 1896; and the 20,000th in 1902.

A banner year in the history of these works was the season of 1889, when the first of the now celebrated compound locomotives was completed and placed on the Baltimore & Ohio Railroad. It was of the four-cylinder type designed by S. M. Vauclain, the general superintendent, a high and a low-pressure cylinder being carried on either side of the smokebox, the high-pressure above and the low-pressure below, although in some later engines the positions are, for convenience, reversed. The two pistons on either side are connected to a common crosshead, and each pair of cylinders is cast in one piece with the piston, steam-chest and one-half of the saddle. The arrangement is shown very clearly in the accompanying perspective view of the cylinders. The valve, which is double and hollow, controls the steam admission and exhaust of both cylinders. The exhaust steam on the high-pressure cylinder becomes the supply steam for the low-pressure cylinder; and as the steam for the high-pressure cylinder enters the steam-chest at both ends the valve is in practically perfect balance. A by-pass valve is provided to admit live steam to the low-pressure cylinder in starting.

In view of the fact that there is, even to-day, a rather widespread, although mistaken, idea among railroad men that the superiority of the compound to the single-expansion locomotive is doubtful, it is well to draw attention here to two facts: First, that the scientific tests which have been made in experimental engineering laboratories, such as those at Purdue